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JULY 1977

35p

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TV GAMES RIFLE
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NEWS . . . CONSTRUCTION . . . DEVELOPMENT . . . AUDIO

WIRING PEN OFFER

BE A CATHODE RAY COWBOY WITH OUR TV GAMES RIFLE

FROM CIRCUIT AND TEXT BY WATFORD ELECTRONICS

THE TV GAMES UNIT featured in our May '77 issue has provision for the addition of two rifle games. In both games a target appears on the TV screen and the object is to 'hit' this with the TV rifle. When the trigger of the rifle is pulled a shot counter is incremented by one and if the rifle is on target the hit counter is incremented, a hit noise produced and the target blanked for a while.

The difference between the two game options is that in one the target moves randomly about the screen and in the second the target traverses the screen from left to right under the control of the manual serve button.

Unlike the other games, the score does not appear on the screen during the game since this might confuse the player, instead the score appears after 15 shots. The score is displayed with the number of shots (i.e. 15) on the left and the number of hits on the right.

Seeing the light

The rifle uses a photodarlington to detect the target on the TV screen but relies on careful construction of the optics involved to ensure adequate sensitivity is obtained from the unit. We also arranged for the rifle to ignore any sources of light other than the target on the TV screen.

Though we called this project a TV rifle game we finally settled on what might more accurately be described as a pistol. The general method of construction used in the pistol is shown in Fig. 1.

Getting started

The butt is made from a fairly hard wood and after being fashioned to the shape shown in

the drawing, the top was dished with a half round file to accommodate the barrel. The next step is to drill a hole vertically through the butt to take the connecting cable between the pistol and games unit. The trigger switch is mounted by drilling two holes, one above the other, and chiselling out the remaining wood to form an oblong hole. A small aluminium plate was then drilled to accept the switch and two small wood screws used to secure the plate to the butt.

Roll out the barrel

The barrel is made from 28mm dia. metal tube 8½in. in length. To fit it to the butt two holes were drilled at one end, and two further holes drilled diametrically opposite the first pair. By passing a screwdriver through the top holes the barrel may be secured to the butt.

The lens used in the pistol had a focal length of 2½in. and came from an old jeweller's eye glass,

this was mounted in a B9A valve screening can. The photodarlington should be carefully positioned at the focal point of the lens. We mounted the photodarlington on a piece of veroboard which enabled us to slide it back and forth until its position was correct.

The assembly may then be mounted in the barrel.

End in sight

The front sight was formed from a 4BA bolt which was filed to provide a sight tip. The rear sight is formed from a ⅜in. wide strip of aluminium about 2½in. long. One end is bent up and a 'V' slot filed with a needle file.

At this stage the p.c.b. may be assembled. The only thing to note about the components used is that they must be as small as possible, we used tantalum beads for C3, C5 and sub miniature electrolytic types.

When the board has been assembled wire it to

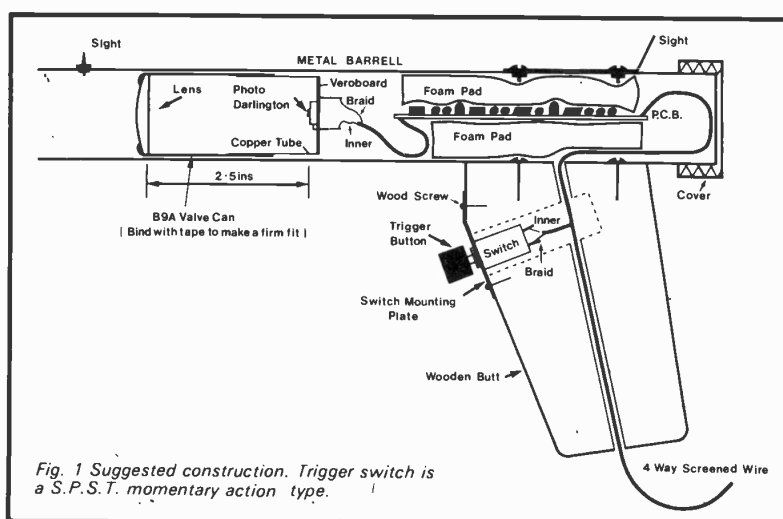
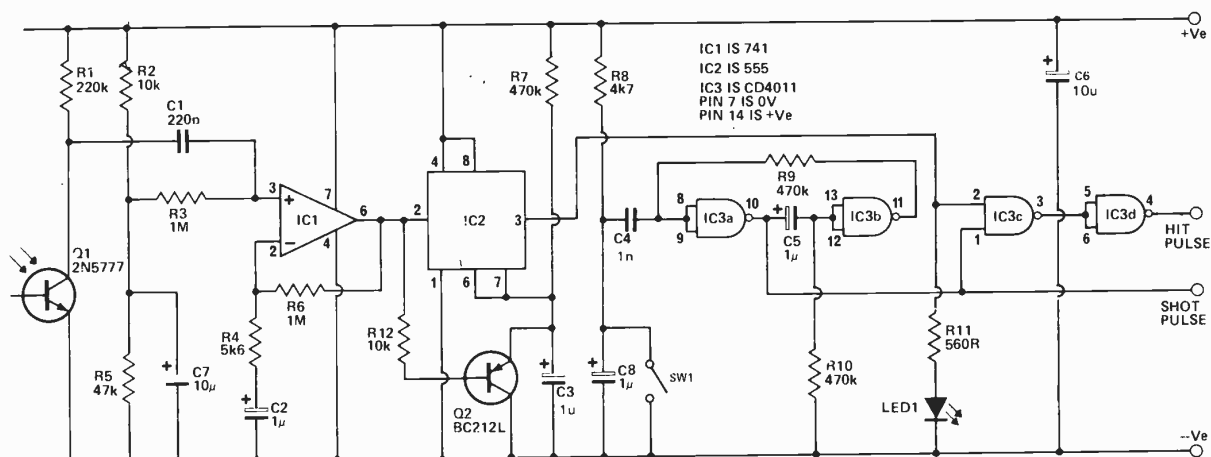


Fig. 1 Suggested construction. Trigger switch is a S.P.S.T. momentary action type.



Full circuit diagram of the TV games rifle.

PARTS LIST

RESISTORS (all 1/2 W 5%)

R1 220 k
R2 10 k
R3 1 M
R4 5k6
R5 47 k
R6 1 M
R7 470 k
R8 4k7
R9 470 k
R10 470 k
R11 560 R
R12 10 k

CAPACITORS

C1 220p polystyrene
C2 1μ 16 V electrolytic
C3 1μ 35 V tantalum
C4 1 n polystyrene
C5 1μ 35 V tantalum
C6 10μ 16 V electrolytic
C7 10μ 16 V electrolytic
C8 1μ 16 V electrolytic

SEMICONDUCTORS

LED1 TIL209
Q1 2N5777
Q2 BC212L
IC1 741
IC2 555
IC3 CD4011

MISCELLANEOUS

PCB
Trigger switch - see text
Lens - 2 1/2" focal length, 1" diameter
Metal tube 8 1/2" long
Wood for butt
4 core screened cable
Misc. hardware for sights etc.
A complete kit is available from Watford Electronics, including lens, tube and butt.

HOW IT WORKS

Q1 is the photodarlington detector. Signals appearing at its collector, due to the target on the TV screen, are coupled by C1 and R1 from the high pass filter required to reject spurious light sources. IC1 has a gain of about 200 at high frequencies, but its gain drops to unity at dc, due to the effect of C2 included in its feedback loop.

The no signal level of the output is set by R2 and R5 to about one volt lower than the supply rail.

When the target is detected, the output of IC1 falls and triggers IC2 which is arranged to operate as a monostable. Pin 3 of IC3 will go high. Q2 is included to make IC2 re-triggerable; its out-

put will remain high until one period after the input signal returns high.

The output of IC2 is fed to IC3c and to the on-target LED.

The trigger switch SW1 is coupled to a monostable formed by IC3a and IC3b. The output of IC3a is normally low and goes high for a few milliseconds when SW1 is operated. This output is the 'shot pulse' and is fed to IC3c, where it is 'NANDed' with the on-target pulse, resulting in a hit pulse which is inverted by IC3d.

The hit pulse is fed to pin 27 of the AY3-8500 and the shot pulse is fed to pin 26 of the games chip.

C6 decouples the supply rail.

GETTING HOLD OF COMPONENTS

Watford Electronics will supply a complete set of parts including lens, barrel and butt.

COST OF CONSTRUCTION

The cost of the Watford Electronics kit for this project is £10.50.

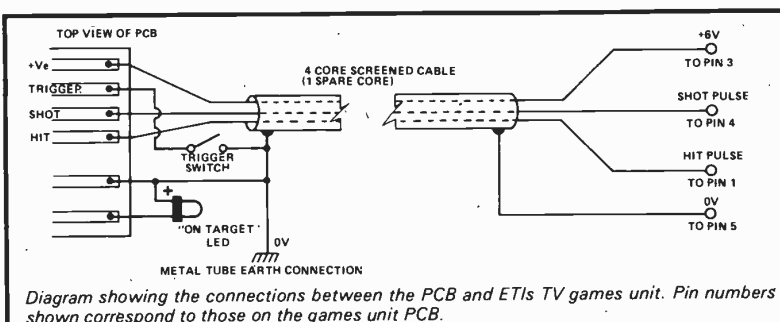
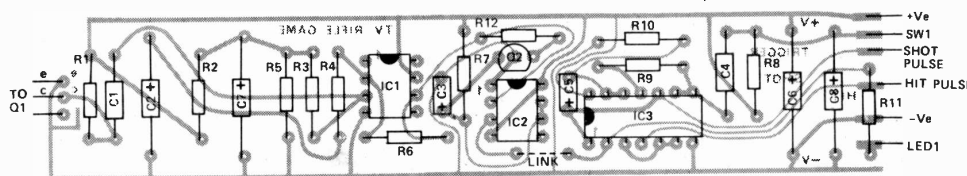
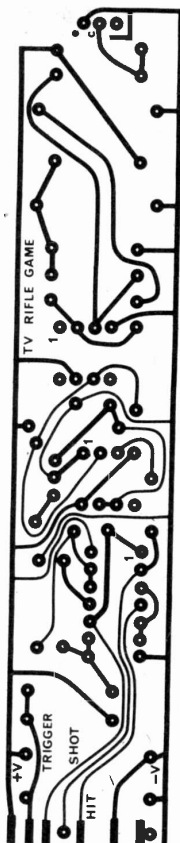


Diagram showing the connections between the PCB and ETIs TV games unit. Pin numbers shown correspond to those on the games unit PCB.

Component overlay for games rifle board shown full-size.



TV GAMES RIFLE



the trigger switch and to the connecting cable. It may then be mounted at the rear of the barrel by gluing it to a foam pad which may in turn be stuck to the barrel.

The connecting wire we used was four core screened cable and should be connected to the games unit as follows: (via DIN plug)

0V	to pin 5
6V	to pin 3
Hit pulse	to pin 1
Shot pulse	to pin 4

The sight may then be adjusted so that the hit LED is on when the pistol is aimed at the score.

To play

Select the rifle option required with SW2 and press the reset and serve buttons. The target should appear on the screen and bounce around the screen until hit.



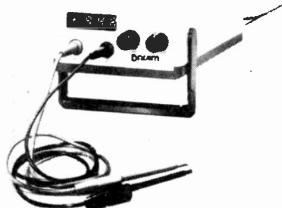
The PCB layout is shown full size on the left. Above is a picture showing the games rifle.

Testing

The games unit should now be connected to your TV and the brilliance control of the TV adjusted until the target is bright and the background just visible. If the rifle is now aimed at the target, at close range initially, the 'On Target' LED should glow and a blip should be heard from the speaker when the trigger is pressed.

To adjust the sights use the score display which appears at the end of the game. Block off all the screen except one digit of the score

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